

**Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554**

In the Matter of)	
)	
Amendment of Parts 1, 2, 22, 24, 27, 90 and)	WT Docket No. 10-4
95 of the Commission's Rules to Improve)	
Wireless Coverage Through the Use of Signal)	
Boosters)	

COMMENTS OF WIRELESS EXTENDERS, INC.

Wireless Extenders, Inc. (“Wi-Ex”) hereby submits its comments to the Commission’s Notice of Proposed Rule-Making (“NPRM”)¹ in the above-captioned proceeding regarding the use of signal boosters to improve wireless coverage.

Wi-Ex commends the Commission for recognizing that “[t]he public interest is best served by ensuring that consumers have access to well-designed boosters that do not harm wireless networks.”² As wireless services not just grow in popularity but become an indispensable part of Americans’ lives, consumers need to be able to receive wireless service at all times, and especially in the places they spend most of their time — at home, in the office, or in their cars.³ With technological advancements and innovation by manufacturers such as Wi-Ex, consumers today can purchase signal boosters that allow them to use their wireless service at the places they most need to at relatively low cost. As the Commission rightly noted in the NPRM, “[t]he relatively low-cost, coverage enhancing features of signal boosters will . . . help

¹*Amendment of Parts 1, 2, 22, 24, 27, 90 and 95 of the Commission’s Rules to Improve Wireless Coverage Through the Use of Signal Boosters*, Notice of Proposed Rule-Making , WT Docket No. 10-4, FCC 11-53 (rel. Apr. 6, 2011).

² NPRM at 2, ¶ 2.

³ NPRM at 2, ¶ 1 (noting that signal boosters held “great potential to empower consumers in rural and underserved areas to improve their wireless coverage in their homes, at their jobs, and when they travel by car, recreational vehicle, or boat.”).

many Americans to enjoy the dynamic growth in the variety and quality of wireless service offerings.”⁴

Wi-Ex also supports the Commission’s focus on a regulatory framework that authorizes individuals to operate “consumer signal boosters.”⁵ As it goes forward in this proceeding, the Commission should ensure that it adopts a framework that enables consumers to use affordable, practical signal boosters. Wideband signal boosters that work across different spectrum bands allow consumers to extend coverage in their homes for multiple service providers, enhancing competition in the marketplace and saving consumers money while actually improving carrier network capacity. With appropriate safeguards, such signal boosters will protect carrier networks while meeting consumer needs.

I. BACKGROUND AND INTRODUCTION

A. About Wi-Ex

Founded in 2002 and headquartered outside of Atlanta, GA, Wi-Ex (<http://www.Wi-Ex.com>) develops, manufactures and distributes the zBoost[®] product line of cell phone signal boosters for the home, office or car. zBoost[®] products overcome weak or slow wireless signals by Extending Cell Zones[®] — taking useful signals from one area (outdoors or an outdoor window) and extending those signals indoors while maintaining the integrity of the carriers’ networks using patented and patent-pending technologies. As the leader in consumer boosters, Wi-Ex continues to innovate including ease-of-use, consumer education, signal quality, and network protection. In early 2006, Wi-Ex was recognized as one of Georgia’s top 10 Innovative Companies. We were selected by the 2007 International Consumer Electronics Show (CES[®]) as an Innovations 2007 Design and Engineering Awards honoree and a finalist for the CTIA

⁴ NPRM at ____.

⁵ NPRM at 2, ¶ 3.

Emerging Technologies (E-Tech) Award at CTIA WIRELESS 2007 and 2009 - Mobile Accessory category. Wi-Ex is a proud member of CTIA, CEDIA, and CEA.

B. The Value of Consumer Signal Boosters

Wi-Ex applauds the Commission for recognizing that, in order to bring about the widest benefit, pragmatic solutions must prevail. Wi-Ex seeks to collaborate with the Commission, carriers, and other manufacturers to meet the stated goal to “broaden the availability and use of signal boosters to enhance wireless coverage for consumers” In doing so, Wi-Ex urges the Commission to ensure that its regulations permit a vibrant consumer market by allowing manufacturers to make and sell affordable signal boosters that meet consumers’ needs. In Wi-Ex’s experience, if a device costs more than a few hundred dollars, it is no longer a viable option for most consumers. Accordingly, as the Commission considers safeguards needed to protect wireless networks, it should ensure that the rules it adopts preserve a viable market for consumer boosters lest the advantages of signal boosters identified by the Commission be effectively unavailable to most consumers.

In evaluating proposals designed to address interference concerns raised in the NPRM, the Commission should be mindful of the differences between high-gain, “carrier-grade” booster solutions vs. lower-gain, consumer solutions. Consumer boosters are different because they only address a small space (*e.g.*, a home) and a small number of users (*e.g.*, family). In addition, a consumer booster solution is typically a “best effort” solution, meaning that it will work in most situations, but it may not work for certain locations or certain environments. The performance and quality of consumer solutions are generally the responsibility of the purchaser (*i.e.*, if the purchaser is unhappy, they may improve the installation — working with the device manufacturer’s customer service department as needed — or return the device). Carrier-grade

solutions typically address a medium to large public space (*e.g.*, shopping mall, tunnel, public arena, etc.) for many users and where multiple mobile devices may be present from every local carrier. The performance and quality of a carrier-grade solution belongs to the carrier and if the customer or carrier is unhappy, the carrier usually sends a truck out to fix or replace the device.

Further, when considering the causes of interference, the potential impact of a signal booster with a relatively low gain (*e.g.*, below 75dB) are far less significant than that of signal boosters with higher gains (*e.g.*, above 90dB). In fact, given the necessity to prevent oscillation in signal boosters, the gain of the system in consumer boosters will naturally be limited due to the small spaces and the physics of the available antenna isolation, resulting in a gain of between 55dB and 70dB.

II. THE COMMISSION SHOULD ADOPT A REGULATORY FRAMEWORK THAT PROMOTES THE USE OF CONSUMER BOOSTERS THAT DO NOT REQUIRE PRIOR APPROVAL FROM WIRELESS CARRIERS

Wi-Ex supports the Commission's approach of authorizing the use of consumer signal boosters that comply with existing applicable technical rules and safeguards aimed at preventing and controlling interference to wireless carrier networks. Wi-Ex already designs and sells such devices, which include safeguards needed to ensure that the signal boosters shut down when they detect oscillation and adapt their operation to remain compatible with wireless carrier networks.

However, as discussed below, Wi-Ex has concerns regarding the proposed requirement of coordinating frequency and power levels with carriers prior to operation. Wi-Ex urges the Commission to carefully reconsider before including any proposals which create additional burdens upon consumers needing signal boosters to receive a reliable wireless signal in their homes, offices, and cars. The current burdens of cost and installation are already significant barriers for many consumers with poor signal quality. Wi-Ex believes — and indeed its products

demonstrate — that other means are available to accomplish the necessary protections to the wireless networks.

A. Fixed Signal Booster Coordination

For consumer signal boosters, we do not believe that coordination of frequency and power is necessary nor practical, nor do we believe that it is consistent with the stated goals of ensuring that boosters serve the public good by being low-cost (relatively) and usable by consumers. First, frequency coordination is not necessary to avoid interference. The only basis that we find to support frequency coordination for CMRS is carrier channel planning and reuse. Frequency planning and reuse can be an issue for outdoor repeaters with high system gains around 100dB and where the repeater coverage area overlaps with additional base stations. This issue does not arise for a consumer booster which merely transfers or boosts the outdoor signal to a physically close and relatively small indoor space with total system gains less than, say, 75dB. This scenario is no different than the user standing outside at the donor antenna location without a booster; the mobile device (phone) and the carrier network already accommodate cell overlap. Therefore, we see no compelling reason to burden consumers with a requirement to coordinate a booster's frequency of operation. Additional related issues will be discussed in a later section weighing the merits of wideband vs. block-specific boosters.

Second, power level coordination is not necessary to avoid interference. The rationale discussed in the NPRM was to protect networks which maximize capacity using careful mobile power control from overload due to the additional gain/power from a booster. Wi-Ex recognizes the network value of power control and our wideband fixed-location boosters resolve this issue in a way similar to mobile boosters. The need for a low mobile uplink (or reverse link) corresponds to a very strong downlink (or forward link) power at the fixed location of the

booster. In a wideband booster, this strong downlink combines with all of the downlink signals in a band and results in a reduction in downlink gain in the booster to maintain amplifier linearity and downlink purity. To further protect the uplink power control, Wi-Ex boosters make a corresponding reduction in the uplink gain as well. This is an example of a “best effort” solution which sacrifices booster performance for the consumer’s weak signal in order to benefit the downlink purity and uplink power control for all carriers. The low-gain (<75dB) of consumer boosters along with this mechanism also addresses concerns of general uplink noise and the “Adjacent Channel Noise” issue.

Third, Wi-Ex is doubtful that such carrier/operator coordination is practical due to the following:

- a) Consumers gift or resell electronics (so a reseller registration is impractical);
- b) consumers decommission and recommission devices regularly and power outages are not uncommon, so any power-on registration technique would have to be repeated which would make operation intolerable;
- c) consumers move their place of residence or business, which would require re-registration and coordination, which is impractical and unlikely to occur.⁶

Finally, the Commission must not overlook the difficulty involved in consumers being required to coordinate the operation of signal boosters with wireless carriers. As the Commission recognizes, wireless service providers may not always promptly respond to coordination requests⁷ — either because of competitive reasons where they choose to support only carrier-provided signal boosters or simply because of a lack of incentive or knowledge to

⁶ A solution that would, for example, require the use of GPS to locate and automatically register a booster would add close to half the cost of a consumer signal booster, making such a solution effectively unworkable.

⁷ NPRM at 19, ¶ 52.

provide adequate customer support. While not a perfect analogy, the example of cable operators providing CableCARDS to subscribers using third-party set-top boxes is instructive as a regime in which consumers face inordinate delays and difficulties in connecting retail devices to a network where prior approval/coordination of the network operator is required. In general, device attachment rules work best when necessary technical safeguards are built into the rules for manufacturers, and consumers are able to use well-designed retail devices without prior approval or coordination with the network operator in question.

B. Wideband vs. Block-Specific Boosters

While there are many understandable justifications for why a carrier desires a booster solution that only benefits its network, the consumer boosters sought to meet the stated goals of the Commission MUST be wideband for a number of reasons. First, as explained below, in terms of the issues they are designed to address, a wideband booster is a consumer-focused booster, while a block-specific booster is a carrier-focused booster. Consumer boosters are designed to capture an adequate signal provided by the carrier outside a home or office to overcome factors which are in most cases outside of the carrier's control (*e.g.*, energy efficient building construction, tree foliage, etc.) In such cases, it is the consumer that desires to improve his or her property to utilize the signals provided outside by one or more carriers, as opposed to the carriers needing to improve their networks to penetrate difficult (and changing) building construction and landscaping. Moreover, while carriers always have the option of providing a carrier specific device to their customers, a consumer booster is intended to benefit the needs of the purchaser rather than a single service provider. A consumer spending several hundred dollars to ensure an acceptable level of wireless coverage wants a device that will work with all carriers that individuals within the house (including guests) may use, both at present and in the

future.

Second, block-specific boosters are significantly more expensive than wideband boosters. There is no real justification for a consumer to pay far more for a booster which provides far less benefit to them. For example, the most popular Wi-Ex booster is the YX545 which can be purchased for under \$200 and which provides over 2,500 square feet of signal coverage for all carriers in the cellular/850 band and the PCS/1900 band (4-6 carriers Compare this to a currently available approved block-specific booster by Verizon Wireless⁸ (which still does not meet all of the criteria recommended in the AT&T proposal). It is \$1,295 and provides over 3,000ft² of coverage for one carrier, making it a significantly more expensive solution that is out of reach of most consumers.

Third, block-specific boosters are not immune from creating additional types of interference. For example, block-specific boosters are designed to only amplify a licensee's frequency block(s) by using highly selective, narrowband filtering. The sharp rolloff of these filters occurs through one or more channels licensed by other carriers adjacent to each side of the boosted block. Precisely because the filter rolloff is steep, it introduces dramatic distortion in gain, phase, and delay, thus interfering with the use of those channels in the area. The narrowband filtering also adds significant signal delay inside of the boosted frequency block, which can introduce location inaccuracies for network based E-911 systems.

Fourth, block-specific boosters must include a method of determining which frequency blocks are appropriate for a particular carrier in any particular region. This is challenging both in terms of logistics and technology and both add cost to the solution. Logistically, the frequency blocks used by a given carrier are different from region to region. In addition, the frequency

⁸ The Verizon Wireless-approved booster is supplied by Juni. The \$1,295 price does include installation, but is also the direct price (without the inventory and distribution requirements and costs of a typical consumer device).

blocks are often traded or sold among carriers and even subdivided into smaller blocks.

Furthermore, the various sizes of the frequency blocks used by carriers also require complexity in the hardware used in boosters and cost in the filter technology. This complexity is multiplied again by non-contiguous frequency blocks.

In summary, block-specific boosters are more expensive and do not work as well for consumers, and also can introduce greater distortion in terms of delay for network-based E-911 systems. In contrast, wideband boosters are a more effective and practical solution for consumers, allowing them to purchase a single device that will enhance coverage for all users within the household, regardless of which carrier they use. Accordingly, the Commission's rules should support the use of wideband, consumer-oriented signal boosters.

C. Booster Self-Monitoring

Wi-Ex agrees that all boosters must self-monitor for maximum output power and oscillation and make adjustments or shutdown as necessary to avoid generating interference. A booster system cannot ultimately control its input signal(s), so to avoid adding excessive distortion or interfering spurious emissions (*e.g.*, OOB), it must maintain amplifier (BDA) linearity for any input. Wi-Ex products already do this using a type of gain control called Automatic Level Control (ALC) which limits the output power to a factory-calibrated threshold. Any time an input signal causes an output to exceed the threshold, that band's gain is lowered within a fraction of a second to return the output to a safe level. If the gain cannot be lowered enough, one or more of the BDA's amplifier chains must be temporarily shut off, in order to prevent potentially harmful emissions.

Likewise, a booster cannot fully control its antenna placement or installation environment, as these vary depending on the individual consumer and his or her environment.

For self-oscillation, however, ALC is not sufficient. Wi-Ex uses several proprietary techniques to maintain a margin of safety for isolation. If, at any time, the environmental isolation is lower than the booster system gain, a self-oscillation will be detected by the BDA. Within a fraction of a second, the booster automatically reduces the gain of one or more amplifiers to eliminate the oscillation and any harmful effects.

We do not believe, however, that it is necessary (nor even possible) to monitor OOB. Monitoring OOB is not necessary because the forms of potentially interfering OOB can effectively be eliminated through the process of device certification, as is the current practice.

III. CONCLUSION

Wi-Ex supports the Commission's goal of a regulatory framework that promotes the use of signal boosters by consumers to enhance wireless coverage. In doing so, the Commission should not adopt regulations — such as requiring prior approval or coordination from wireless carriers — that keep signal boosters from being effective as consumer solutions. Moreover, as explained above, wideband boosters are vastly simpler and more cost-effective than block-specific boosters. Thus, the solution that the Commission seeks through this NPRM must include the use of consumer-focused wideband boosters.

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Respectfully submitted,

WIRELESS EXTENDERS, INC.

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